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Full Length Research Paper

Impact of bee pollen as feed supplements on the body weight of broiler Ross 308

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This study was aimed at investigating the meat performance of broiler Ross 308 after the application of bee pollen extract in their diet. The experiment group was fed with bee pollen (400 mg.kg^{-1}) added in the feed. After analysis, it was found that the female chicken group's average live body weight were higher in control group (2246.60 g) than that of experimental group (2194.40 g). Also, the carcass weight, giblelt weight and carcass yield percentage were high in the control group than in the experimental group. However, in case of male group, the average live body weight in experimental group (2354.60 g) were higher than control group (2299.20 g). In addition, the weights (g) of carcass, giblets, and carcass yield (%) were higher in the experimental group than control group, and there were no significant differences (P ≥ 0.05) among the experimental groups. Hence, it was concluded that bee pollen has positive effect on the growth of male chicken in terms of increasing the body weight, whereas it has negative effect on the female chickens.

Key words: Broiler, pollen, carcass weight, live body weight, carcass yield.

INTRODUCTION

The prominence of poultry production today is primarily due to the short generation interval and relatively quick turn over on investment and high quality protein from poultry products (Adeyemo et al., 2010). Production of poultry meat for the rapidly growing human population is an important system for supplying high-quality protein and provides an interesting source of finance (Gueye, 2009). The ratio of the composition of feed mixtures for chickens is important in terms of the required nutrients and energy. The increasing energy and nutrients in chickens' feed mixtures are likely to increase their body weight without changing the quality of the carcasses of chickens (Donaldson et al., 1957; Combs and Nicholson, 1964; Saleh et al., 2004; Haščík et al., 2010). The growth promoters and feed additives in chicken's diets have been used for many years (USDA, 2008).

The bees are among the beneficial insects that produce mainly the honey, and also many by-products such as royal jelly, beeswax, propolis, pollen and bee stings. Bee pollen represents a rich source of proteins (25%), essential amino acids, oils (6%), containing more than 51% of polyunsaturated fatty acids of which 39% represent linolenic acid, 20% represent palmitic acid and 13% linoleic acid. Bee pollen also represents a source of more than 12 vitamins, 28 minerals, 11 enzymes or co-enzymes, 11 carbohydrates (35 - 61%; mainly glucose, fructose and sucrose), free amino acids, flavonoids, carotenoids and phytosterols (Crane, 1990; Abreu, 1992;

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Table 1. Ingredients and nutrient composition of experimental feed mixture.

Ingredient (%)	Starter HYD-01 (1 to 21 days of age)	Grower HYD-02 (22 to 42 days of age)
Wheat	35.00	35.00
Maize	35.00	40.00
Soybean meal (48% N)	21.30	18.70
Fish meal (71% N)	3.80	2.00
Dried blood	1.25	1.25
Ground limestone	1.00	1.05
Monocalcium phosphate	1.00	0.70
Fodder salt	0.10	0.15
Sodium bicarbonate	0.15	0.20
Lysine	0.05	0.07
Methionine	0.15	0.22
Palm kernel oil Bergafat	0.70	0.16
Premix Euromix BR 0,5 %	0.50	0.50
Nutrient composition (g.kg^{-1})		
Crude protein	210.76	190.42
Fibre	30.19	29.93
Ash	24.24	19.94
Ca	8.16	7.28
P	6.76	5.71
Mg	1.41	1.36
Linoleic acid	13.51	14.19
ME_N (MJ.kg^{-1}), calculated	12.02	12.03

Xu et al., 2009). There are great amount and variability of bee pollen phenolic constituents (total phenols, phenyl-propanoids, flavonoids and anthocyanins) and its antioxidant activity (Broadhurst, 1999; Leja et al., 2007; Šaric et al., 2009). Its use in the human diet is very highly appreciated (Serra Bonvehi et al., 1991; Block et al., 1994).

Bee pollen has recently received an increased attention for its antibacterial (Garcia et al., 2001; Proestos et al., 2005; Carpes et al., 2007) and anti-fungicidal effects (Garcia et al., 2001). In mice, bee pollen constituents can be found in the blood, in cerebrospinal fluids, and in the urine within 2 h after ingestion (Markham and Campos, 1996). Diets supplemented with 1.5% bee pollen could boost the early development of thymus and *Fabrici bursa*, retard the bursa degeneration and promote the immune response of spleen chickens (Wang et al., 2005). Crane (1990) reported that in the liver and brain of mice, bee pollen affected several gene expressions that are important in the apoptosis pathway and chemiotaxis (Šaric et al., 2009).

One of the most widely used natural supplements is the bee pollen because it contains most of the essential nutritional elements needed for growth and development in humans and animals (Orzaez et al., 2002; Bell et al., 1983), and it could also promote the early development of the digestive system, and therefore is a potentially beneficial food supplement (Wang et al., 2007). The aim of this study was to verify the influence of the addition of bee pollen extract in the feeding mixture diet of broiler chickens Ross 308. This effect will be considered in terms of changes in body weights of the chicken.

MATERIALS AND METHODS

The experiment was implemented in test poultry station of Slovak University of Agriculture in Nitra. The tested chickens were Ross 308. The experiment included 180 one day-old chicks, which were divided into 2 groups: control (C) and experimental (E). Each of the group was also segregated according to the gender. The fattening duration was 42 days. The chickens were bred in a cage conditions; each cage was equipped with feed disperser and water intake was ensured *ad libitum* through a self feed-pump. The temperature was controlled during fattening period and it was 33°C at the first day and every week it was reduced about 2°C. The lighting during the feeding period was continuous. Each group was fed by same starter complete feed mixture (CFM) HYD-02 (loose structure) until to 21st day of their age. From the 22nd to 42nd day of their age, chickens were fed by grower fatting (CFM) HYD-02 (loose structure), in all investigated groups of experiments (Table 1.).

The feed mixture, HYD-01 and HYD-02, had been produced without antibiotic preparations and coccidiostatics. During the fattening, all groups were fed by the same complete feed mixture; however, to chickens of the experimental group, pollen extract in

Table 2. Effects of bee pollen on growth performance and yield of broiler Ross 308 (female).

Data	Live body weight (g)		Carcass weight (g)		Gilblets weight (g)		Carcass yield (%)	
	Group C	Group E	Group C	Group E	Group C	Group E	Group C	Group E
n	30	30	30	30	30	30	30	30
x	2246.60	2194.40	1573.20	1510.40	179.36	167.27	78.01	76.49
S.D.	115.02	73.79	83.63	29.913	15.81	15.46	1.56	1.52
Min.	2157.00	2115.00	1484.00	1488.00	161.89	143.89	76.40	74.40
Max.	2375.00	2285.00	1690.00	1556.00	197.01	186.19	79.88	78.46
CV%	5.12	3.36	5.32	1.98	8.82	9.24	2.00	1.99
SS	P ≥ 0.05		P ≥ 0.05		P ≥ 0.05		P ≥ 0.05	

n, Number of chicken; x, mean; S.D., standard deviation; CV, coefficient of variation; SS, statistical significance. P ≥ 0.05: not significant.

Table 3. Effects of bee pollen on growth performance and yield of broiler Ross 308 (male)

Data	Live body weight (g)		Carcass weight (g)		Gilblets weight (g)		Carcass yield (%)	
	Group C	Group E	Group C	Group E	Group C	Group E	Group C	Group E
n	30	30	30	30	30	30	30	30
x	2299.20	2354.60	1605.40	1646.40	168.53	172.62	77.17	77.25
S.D.	105.74	23.17	91.41	46.75	15.73	10.04	3.11	1.42
min.	2194.00	2330,00	1478.00	1581.00	150.52	160.77	74.45	75.25
max.	2472.00	2382.00	1698.00	1700.00	193.44	186.30	82.24	78.56
CV%	4.60	0.98a	5.69	2.84a	9.33	5.81	4.03	1.83
SS	P ≥ 0.05		P ≥ 0.05		P ≥ 0.05		P ≥ 0.05	

n, Number of chicken; x, mean; S.D, standard deviation; CV, coefficient of variation; SS, statistical significance. P ≥ 0.05: not significant.

amount 400 mg.kg^{-1} were added to the feed mixtures (HYD-01 and HYD-02). The bee pollen extract was prepared from minced bee pollen (150 g) in the conditions of the 80% ethanol in the 500 cm^3 flask (Krell, 1996). Extraction was carried out in a water bath at 80°C for 1 h. Consequently, the extract was cooled and centrifuged. The obtained supernatant was evaporated in a rotary vacuum evaporator at bath temperature of 40 - 50°C and then weighed. At the end of the fattening (42 days), from each group were chosen 60 chickens for slaughter analysis (30 hens and 30 cocks) and then the meat performance of chickens was determined (slaughter weight, carcass weight, giblets weight, carcass yield). The experimental analysis was evaluated at the Department for Evaluation and Processing of Animal Products in the Faculty of Biotechnology and Food Sciences SPU Nitra, Slovakia. The results of meat performance (arithmetic mean, standard deviation, coefficient of variation) were processed by the statistic program Statgraphics 5.0. For the determination of significant differences between the tested groups, F-test was used followed by t-test.

RESULTS AND DISCUSSION

In the present study, the results obtained showed that there were no significant differences (P ≥ 0.05) between the control and experimental groups. Table 2 shows the results for female group; the body weight (g) for control group (2246.60 g) was higher than experimental group (2194.40 g), the carcass weight (g) was higher in control group (1573.20 g) than experimental group (1510.40 g), the gilblets' weight(g) was higher in control group (179.36 g) than experimental group (167.27 g) and the carcass yield (%) was higher in control group (78.01%) than the experimental group (76.49%). Since the bee pollen stimulates the reproductive female hormones (Kolesarová et al., 2011), some energy are therefore channeled to the reproductive system.

Table 3 shows the results for male group; where the live body weight (g) was higher in experimental group (2354.60 g) than control group (2299.20 g), the carcass weight (g) was higher in experimental group (1646.40 g) than control group (1605.40 g), the giblets weight (g) in experimental group (172.62 g) was higher than control group (168.53 g) and carcass yield were higher in experimental group (77.25%) than control group (77.17%). The present results confirmed the reports of Angelovičová et al. (2010) who found that the body weight of experimental (1773.53 g) broiler Ross 308 was higher than in control group (1708.48 g) by about 65.05 g, with the addition of bee pollen (0.10%). Similar results were also reported by Wang et al. (2007) who found that the body weight of chickens fed with bee pollen addition (1585.67 ± 68.27 g) was higher than in control group (1173.33 ± 44.13 g). They also found that the size of the small intestine in experimental group was longer than in the control group.

The study by Attia et al. (2011) confirmed our results with rabbits fattening; they added bee pollen in different concentrates (T1-100, T2-200 and T3-300 g) to rabbits feed mixture and found that the body weight of the experimental group (T1-3094.00 ± 190.10, T2-2999.00 ± 175.20 and T4-3015.00 ± 155.00 g) was higher than the control group (2990.00 ± 186.40 g). Our study was also in agreement with that of Haro et al. (2000) who reported that at the end of their experiment, the group of rats fed with only bee pollen and water in the nutrition during 12 weeks was healthier with increased weight. On the contrary, Eman (2010) found that the different doses of bee pollens (2.5, 5 and 10 g. kg^{-1} of body weight. day^{-1}) as nutritional supplement for pregnant rats had harmful effect on the mother's and also to fetus' life.

Conclusion

From the present results, it was concluded that the use of bee pollen as a dietary supplement in feed mixture of broiler Ross 308 in amount of 400 $mg.kg^{-1}$ led to an increase in the live body weight, carcass weight, giblet weight and carcass yield in males, but it had negative effect on the females, as it decreased the body weight of the hens.

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